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OHIO MOSSES, DICRANALES.*

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In the present paper, the writer has treated the Dicranales in the same manner as the Polytrichales and Bryales were treated in previous papers. Some species have been included which have never been reported from Ohio but which, without doubt, are to be found in the state. Probably many others may be found which are not included. The order as presented is comprised of the acrocarpous mosses with a single peristome, the Aplolepideæ. Fissidens has been included in the group although some of the species of that genus are pleuricarpous.

DICRANALES.

Minute to large mosses with usually erect, branched gametophores and the archegonia situated at the tip of the main stalk or of ordinary branches. Peristome single, with the teeth composed of plates made by a deposit on the outer and inner sides of the original cell wall of a single layer of cells; teeth transversely barred, often split; sometimes wanting.

SYNOPSIS OF THE ORDER.

- I. Scales three or more ranked.
 - A. Calyptra not unusual.
 - 1. Scales formed of a single layer of cells; plants light to dark green.
 - a. Peristome teeth not tortuose.
 - 1'. Teeth not striate, not regularly cleft, sometimes wanting,
GRIMMIACEÆ
 - 2'. Teeth striate.
 - a'. Not cleft to the base, divisions broad, .SELAGERIACEÆ
 - b'. Cleft nearly or quite to the base, divisions narrow,
DICRANACEÆ
 - b. Peristome teeth tortuose.....TORTULACEÆ
 - 2. Scales formed of three layers of cells; plants pale green or grayish.....LEUCOBRYACEÆ
 - B. Calyptra entirely enclosing the sporangium.....ENCALYPTACEÆ
- II. Scales two-ranked with edges toward the stalk.....FISSIDENTACEÆ

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KEY TO THE FAMILIES OF DICRANALES.

1. Light gray (scarcely green), forming dense tufts in moist shade..LEUCOBRYACEÆ
1. Light green to almost black..... 2
2. Scales in two rows with edges towards the stalk.....FISSIDENTACEÆ
2. Scales in three or more rows, edges not toward the stalk..... 3
3. Plants black or blackish with colorless scale apices, growing on rocks,
GRIMMIACEÆ
3. Plants green to light yellowish-green, or if dark, then on the soil..... 4
4. Scales papillose, spatulate to ligulate..... 5
4. Scales not papillose, or if so, then acuminate..... 6
5. Calyptra cucullate; costa often excurrent.....TORTULACEÆ
5. Calyptra not cucullate; costa not at all or barely excurrent...ENCALYPTACEÆ
6. Very small mosses on rocks; peristome teeth not 2-parted, broad; costa
cells homogenous.....SELIGERACEÆ
6. Small to large mosses; teeth 2-parted, narrow; costa cells heterogenous,
DICRANACEÆ

GRIMMIACEÆ.

Cespitose mosses; scales blackish, often with colorless apices, lanceolate; seta short, sporangium immersed or emergent, globose to cylindrical, peristome single of 16 papillose teeth, red or yellowish; calyptra small; usually on rocks.

1. Scales crisped, without hyaline point, costa with median guides;
sporangium immersed.....*Glyptomitrium*
1. Scales not crisped, point usually hyaline, costa with basal guides or
homogenous; sporangium immersed or exserted..... 2
2. Branches irregular or short; teeth filiform, divided almost to the base,
Rhacomitrium
2. Branches of almost equal height; teeth undivided or only in the outer
half, sometimes none.....*Grimmia*

1. GLYPTOMÍTRÍUM Brid. (*Ptychomitrium* Fuern.).

Greenish-yellow to blackish, radiculose at the base; scales dense, spreading when moist, costa percurrent or ending below the apex; setae straight, usually clustered; sporangium erect, exserted, peristome inserted below the mouth, teeth usually divided, operculum with a straight point; calyptra campanulate, deeply lobed. Autoicous.

Glyptomitrium incurvum (Schwaeg.) Broth. (*Ptychomitrium incurvum* Sull.). Dark green, densely cespitose, erect, up to ¼ in. tall; scales linear-lanceolate, obtuse, margin plane, costa ending at the apex; lower scales smaller than the upper; sporangium ovoid, operculum almost as long as the urn. Spring. On limestone rocks. There is no specimen in the herbarium but the species is reported as common in southern Ohio by Lesquereux and James.

2. GRÍMMIA Ehrh. Hedw.

Densely cespitose; scales crowded, lanceolate with a hyaline point, squarrose-recurved when moist; lower ones smaller, entire acuminate, concave, plane or revolute; perichaetial scales larger; seta short sporangium rarely exserted, globose, to cylindrical peristome reddish-brown, rarely absent.

1. Hyaline point a long hair; sporangium shorter than the seta....*G. laevigata*
1. Hyaline point short, sometimes not pointed; seta shorter than the
sporangium..... 2

2. Scales narrow, obtuse; loosely cespitose; brownish-green. *G. apocarpa*
2. Scales acuminate; densely cespitose; green. 3
3. Sporangium oblong-ovate, smooth. *G. pennsylvanica*
3. Sporangium globose-ovate, wrinkled when dry. *G. conferta*

Grimmia apocarpa (L.) Hedw. $\frac{3}{4}$ -1 in. in height; scales ovate-lanceolate, erect spreading, margin recurved, costa ending at or near the apex, basal cells usually sinuose walled; sporangium immersed, reddish-brown, operculum short-rostrate, peristome reddish-brown, columnella often falling with the operculum. Late spring. On stones. Lake, Clarke, Franklin, Hamilton.

Grimmia conferta Funck. Dense cushions of bright green to grey-green mosses; gametophores slender; scales lance-ovate to oblong, denticulate, costa ending at the apex; sporangium wide-mouthed, peristome teeth light red to orange, operculum apiculate. Spring. On exposed rocks. Lake Co.

Grimmia pennsylvanica Schwaeg. (*G. pilifera* Beauv.). Dark green, up to 1 in. or more tall; scales dense, ovate-lanceolate, margins recurved, apex rough, costa ending in the apex, base yellowish; seta about half as long as the sporangium, sporangium immersed, oblong-ovate, smooth; peristome teeth irregularly split. Autumn. Moist shaded rocks. Clarke, Fairfield, Lake.

Grimmia laevigata Brid. (*G. campestris* Bruch.; *G. leucophaea* Grev.). Loosely cespitose, dark green, hoary because of the hyaline points which are often as long as the rest of the scale; scales dense, larger at the top of the gametophore, ovate-oblong, concave, margins plane, points decurrent along the laminæ; lower scales without the hair point, costa ending in the apex; sporangium elliptical-oblong, smooth, brownish, included; calyptra mitrate, lobed. Spring. Non-calcareous rocks. Reported from Ohio by Lesquereux.

3. RACOMITRIUM Brid.

Robust, loosely cespitose mosses, radiculose at the base, procumbent to erect, uniformly foliate, often with short lateral branches; scales hyaline-pointed, squarrose to recurved; seta long; calyptra mitrate.

Racomitrium aciculare (L.) Brid. (*Dicranum aciculare* Hedw.). Dull green or blackish, 2-3 in. tall, stout; scales erect-spreading, entire or distantly denticulate, costa ending below the apex; sporangium smooth, erect, mouth narrow, oblong-elliptic, brown; peristome teeth cleft to below the middle, short; calyptra smooth at the apex. Rarely found in fruit. Spring. Wet, shaded, noncalcareous rocks. Not reported from Ohio but is in Pennsylvania near our boundary.

SELAGERIACEÆ.

Small mosses growing on rocks; usually unbranched; scales 3-5-ranked, tufted above, the lower ones smaller, lance-subulate, costa cells homogenous; peristome teeth 16; calyptra cucullate; operculum rostrate.

1. Minute, gregarious; alar cells not enlarged. *Selageria*
1. Larger, cespitose; alar cells enlarged. *Blinda*

1. SELAGERIA Br. & Sch.

Stalks rarely branched, 3-angled; scales clasping, basal cells sometimes colored; seta erect, short, sporangium with distinct, stomata hypophysis; peristome teeth simple.

1. Scales entire..... 2
1. Scales denticulate or serrate..... 4
2. On sandstone; seta recurved when moist; sporangium narrow-mouthed,
S. recurvata..... 3
2. On limestone; seta erect, or slightly curved when moist, sporangium
wide-mouthed..... 3
3. Scales 3-ranked; plants .1-.3 in. tall, branched..... *S. trifaria*
3. Scales not 3-ranked; plants less than .1 in. tall, simple..... *S. calcarea*
4. Awn long, tapering; seta erect when moist..... 5
4. Awn short, papillose; seta recurved when moist..... *S. campylopada*
5. Yellowish-green; peristome wanting..... *S. doniana*
5. Dark green; peristome present..... *S. pusilla*

Selageria doniana (Sm.) C. Muell. (*Gymnostomum donianum* Smith; *Anodus donianus* Br. & Sch.) Simple; scales dense, erect, straight, channelled; costa filling the awn, perichaetial scales not subulate, sheathing, antheridia in basal buds; seta straight, sporangium ovoid, hemispherical when empty, hypophysis short, peristome wanting, operculum oblique. Summer. Mrs. Britton reports this species for Ohio.

Selageria pusilla (Ehrh.) Br. & Sch. (*Swartzia pusilla* Ehrh.; *Weisia pusilla* Hedw.). Gregarious, bright dark green mosses; scaleless at the base; scales with an ovate-lanceolate base, costa nearly filling the awn, margins recurved; antheridia in lateral buds; seta erect, sporangium oval-pyriform, mouth wide; operculum oblique-rostrate; peristome red or brown, teeth reflexed when dry. Summer. Erie, Logan.

Selageria calcarea (Dicks.) Br. & Sch. (*Bryum calcareum* Dicks.; *Weisia calcarea* Hedw.). Dark green simple mosses; scaleless below, crowded above, scales erect at the apex, ovate, abruptly subulate, clasping, toothed below, subula entire; costa filling the awn; antheridia in basal buds; seta erect, thick, sporangium erect, pyriform-ovoid, turbinate when dry, brownish, operculum conic-rostrate. Spring. Mrs. Britton reports it from Columbus, Ohio.

Selageria trifaria (Brid.) Lindb. (*Weisia trifaria* Brid.; *S. tristichia* Br. & Sch.). Cespitose, gametophores erect up to $\frac{1}{8}$ in. tall, with numerous sub-apical branches; scales 3-ranked, erect-appressed, base narrow, entire, costa broad, excurrent, awn slender and rough; seta erect, pale yellow; sporangium ovoid-pyriform, broadly turbinate when empty, hypophysis long, stomatose, peristome red; antheridia in lateral buds. Summer. Reported from central Ohio in Lesquereux and James Manual.

Selageria recurvata (Hedw.) Br. & Sch. (*S. setacea* (Wulf.) Lindb.). Gregarious, dark green; scales erect-spreading, caniculate, entire; perichaetial scales tubulose; seta yellowish, arcuate, more erect when old; sporangium ovoid to globose, hypophysis short; peristome orange-pellucid. On rocks in shade. Not reported.

Selageria campylopada Lindb. (*S. recurvata* var. *arcuata* Lesq. & Jas.). Gregareous, simple; scales crowded, costa ending below the apex, basal cells oblong, marginal ones linear, clear; seta recurved when moist, lid beaked, peristome red or brown. Early fall. Mrs. Britton includes Ohio in the distribution of this species but no definite reports have been made.

2. BLINDA Br. & Sch.

Densely cespitose, branching by apical innovations; scales crowded scarcely secund, lance-subulate, caniculate, cells enlarged and orange colored at the base; sporangium sub-globose, calyptra covering the upper half of the sporangium.

Blinda acuta (Huds.) Br. & Sch. (*Weisia acuta* Hedw.; *Grimmia acuta* Sm.; *Bryum acutum* Huds.). Yellowish-green to brown or black, $\frac{1}{2}$ -2 in. tall, almost naked below; scales almost entire; seta long; peristome bright red. On rocks. Summer. No report.

DICRANACEÆ.

Gametophores in dense tufts, erect, branched; scales dense, usually falcate-second, apex usually acuminate; seta usually long; sporangium zygomorphic, cernuous, sulcate when dry; peristome of 16 teeth, usually divided, minutely striate or papillose, sometimes wanting.

1. At least the upper cells of the scales papillose..... 2
1. None of the cells of the scales papillose..... 5
2. Small mosses, less than $\frac{1}{2}$ in. tall..... *Rhabdoweisia* 3
2. Larger, $\frac{1}{2}$ in. or more tall..... 3
3. Alar cells distinctly inflated, often red..... *Dicranum*
3. Alar cells larger than the others, but not inflated..... 4
4. Scales sheathing, acuminate or subulate, not crisped..... *Oncophorus*
4. Scales not sheathing, not subulate or acuminate, crisped..... *Ceratodon*
5. Alar cells inflated, often colored..... 6
5. Alar cells not inflated..... 8
6. Costa narrow; seta erect; sporangium stomate..... *Dicranum*
6. Costa broad; seta curved; sporangium without stomata..... 7
7. Calyptra entire; teeth cleft $\frac{1}{4}$ to the base..... *Dicranodontium*
7. Calyptra fringed at the base; teeth cleft to about the middle, confluent at the base..... *Brothera*
8. Sporangium rupturing irregularly..... 9
8. Sporangium opening by a distinct lid..... 10
9. Sporangium pear-shaped; calyptra mitrate..... *Bruchia*
9. Sporangium ovoid-globose; calyptra cucullate..... *Pleuridium*
10. Hypophysis inflated, as long as the sporangium..... *Trematodon*
10. Hypophysis short or sporangium without a distinct neck..... 11
11. Sporangium nearly actinomorphic and erect; teeth cleft to the base. *Ditrichum*
11. Sporangium mostly zygomorphic, not erect; teeth cleft about half way to the base, confluent at the base..... *Dicranella*

1. BRÛCHIA Schwaeg.

Green protonema sparingly persistent, gametophores simple; scales crowded at the apex, smaller below, subulate in our species, costa broad; seta short, sporangium immersed or slightly exserted, pear-shaped, calyptra mitrate, neck distinct, stomate.

1. Awn smooth; plants up to $\frac{1}{2}$ in. tall; sporangium ovoid-pyriform.. *B. flexuosa*
1. Awn rough, plants minute; sporangium ovoid-oblong..... *B. sullivanii*

Bruchia flexuosa (Schw.) C. Muell. (*Phascum flexuosum* Schw.; *B. brevicollis* Lesq. & Jas.). Small gregarious mosses, about $\frac{1}{8}$ in. tall; scales erect-spreading from a convex base, sub-papillose, alar cells not differentiated, antheridia in the axils of the comal scales or in separate buds; seta usually shorter than the cleistocarpous sporangium. On clay soil in bare fields. May and June. Fairfield Co. This species is probably more common than the records would indicate.

Bruchia sullivantii Aust. (*B. flexuosa* Sull.). Small, gregarious, almost stemless mosses; scales broadly ovate at the base, abruptly subulate; seta and sporangium yellow, neck longer than in the preceding species; abundantly fruiting. Wet clay soil. June and July. Reported from Ohio by Jennings.

2. TREMATODON Rich.

Low, simple, cespitose mosses with yellowish-green, lancesubulate, clasping scales; costa board, alar cells not inflated; seta yellow, usually erect; neck inflated, stomatose; peristome persistent; calyptra cucullate.

1. Neck as long as the sporangium; scales not crisped when dry, costa filling the awn.....*T. ambiguus*
1. Neck almost twice as long as the sporangium; scales crisped when dry, costa not filling the awn.....*T. longicollis*

Trematodon ambiguus (Hedw.) Hornsch. (*Dicranum ambiguum* Hedw.). Sparingly branched, $\frac{1}{8}$ –1 in. tall; scales abruptly contracted into a long subulate point, awn serrulate, perichaetial scales longer; seta erect, $\frac{1}{2}$ –1½ in. long; sporangium orange, cernuous, neck somewhat strumose, urn oblong, horizontal, operculum long-beaked. Late summer. Old fields among the grass. Not reported.

Trematodon longicollis Michx. Smaller than the preceding, about $\frac{1}{4}$ in. tall; sporangium uniformly cylindrical-oblong. Clay soil or sand in old fields. Reported from "northern Ohio" by Lesquereux.

3. PLEURIDIUM Brid.

Gregarious or cespitose, low, green and glossy mosses, with simple or branched gametophores; scales small, erect-spreading, distant, not crisped, upper ones crowded, long-subulate; sporangium cleistocarpous, immersed, erect, ovoid, without a neck; calyptra cucullate.

1. Perichaetial scales abruptly subulate; antheridia gemmiform in the axils of the upper scales.....*P. alternifolium*
1. Perichaetial scales gradually subulate; antheridia in the axils of the perichaetial scales.....*P. subulatum*

Pleuridium alternifolium (Dick.; Kaulf.) Raben. (*Phascum alternifolium* Kaulf.). Densely cespitose, less than $\frac{1}{2}$ in. tall, simple or branching by slender innovations; scale base oval, costa excurrent, filling the serrulate awn; sporangium yellowish to brown, operculum apiculate, with a blunt beak. Old clay fields. Not reported.

Pleuridium subulatum (Huds.) Raben. (*Phascum subulatum* Kaulf.). Densely cespitose, less than $\frac{1}{4}$ in. tall; scales ovate-lanceolate, lower

ones more nearly ovate, minutely denticulate, costa ill-defined, filling the apex; seta shorter than the erect sporangium, yellowish. April-June. Old fields among the grass. Cuyahoga.

4. *DITRICHUM* (Timm.) Hampe.

Small cespitose mosses with simple or sparingly branched gametophores; scales dense, not sheathing, without alar cells, costa broad, perichaetial scales longer; seta erect, lustrous, slender, flexuous; sporangium erect or nearly so, oval to cylindrical; peristome of 16 teeth, split nearly to the base, somewhat twisted, joined by a basal membrane; operculum obliquely conic; calyptra cucullate.

1. Bright green; scales erect-spreading, costa long-excurrent; seta light yellow; paroicous.....*D. pallidum*
1. Yellowish-green; scales erect-appressed, costa short-excurrent or percurrent; seta red or rufous; unisexual..... 2
2. Scales subulate; lustrous, denticulate and slightly grooved toward the apex.....*D. tortile*
2. Scales lanceolate; rather dull, usually entire, deeply caniculate toward the apex.....*D. vaginans*

Ditrichum tortile (Schrad.) Brock. *D. pusillum* (Hedw.) Timm.; *Trichostomum tortile* Schrad.). Usually simple and erect, radiculose below, stalks reddish; scales erect-spreading, somewhat twisted, margins revolute, apex denticulate; seta twisted; sporangium smooth, oblong to oblong-cylindric; peristome reddish. Late autumn. Clay soil in fields or on roadsides. Belmont, Lake, Franklin.

Ditrichum vaginans (Sull.) Hampe. (*Trichostomum vaginans* Sull.; *D. lineare* (Sw.) Lindb.; *D. tortile* var. *vaginans* Grout). Gametophores erect, usually simple, about $\frac{1}{2}$ in. tall; base of scales ovate, concave, margins narrowly recurved; sterile gametophores terete with closely appressed scales; perichaetial scales sheathing; seta $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long; sporangium smooth, brownish, somewhat zygomorphic, erect or inclined; basal membrane short. Late fall and winter. On sandy soil. Fairfield Co.

Ditrichum pallidum (Schreb.) Hampe. (*Trichostomum pallidum* Hedw.). Erect and simple or with erect branches from a creeping base; scales erect-spreading, twisted when dry, lance-subulate, costa long-excurrent; antheridia in buds below the perichaetium; seta yellow, twisted; sporangium reddish-yellow, irregularly sulcate when dry, ovoid-cylindric; peristome reddish. Early summer or spring. On soil in fields and woods. Clarke, Franklin, Greene, Hocking, Lake, Lawrence.

5. *CERATODON* Brid.

Light yellowish-green, radiculose below, branching by slender innovations; sporangium sulcate when old, lid conic; peristome single with a short basal membrane, teeth split nearly to the base.

Ceratodon purpurascens (Hedw.) Jenn. (*C. purpureus* Brid.; *Mnium purpureum* L.; *Dicranum purpurascens* Hedw.). Densely cespitose, green above and brown below, $\frac{1}{2}$ in. or more tall; scales linear, costa strong, percurrent or excurrent, margins revolute; seta $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long,

reddish-purple, twisted; sporangium erect, becoming horizontal when old, curved, strumose; calyptra cucullate; antheridial gametophores more slender. May and June. Common on dry soil.

6. DICRANÉLLA Schimp.

Densely cespitose or gregarious, mostly small, sparingly radiculose; scales slender, giving the moss a silky appearance, crowded above more distant below, costa percurrent or excurrent, apical portion usually grooved; seta erect, usually twisted; peristome teeth two or three-cleft; our species unisexual.

1. Costa wide, not well-defined at the base; seta yellowish..... 2
1. Costa narrow, sharply defined; seta red..... 4
2. Costa broad to the shoulder of the scale, then tapering to the apex; sporangium strumose..... *D. cerviculata*
2. Costa tapering gradually from the base; sporangium not strumose..... 3
3. Sporangium erect and actinomorphic..... *D. fitzgeraldi*
3. Sporangium somewhat cernuous..... *D. heteromalla*
4. Scales entire; sporangium cernuous, twisted to the right..... *D. varia*
4. Scales serrulate or denticulate; sporangium erect or inclined to the left, *D. rufescens*

Dicranella heteromalla (Dill.) Schimp. (*Bryum heteromallum* Dill.; *Dicranum heteromallum* Hedw.). Cespitose, simple or forking, $\frac{1}{4}$ – $1\frac{1}{2}$ in. tall; scales secund, lance-subulate, grooved, faintly denticulate toward the apex, costa to $\frac{1}{3}$ the width of the scale at the base; seta $\frac{1}{2}$ –1 in. long, flexuous, twisted to the left; sporangium oblong-ovoid, slightly curved, dark brown, when dry bent to one side just below the mouth, increasingly furrowed with age; peristome red, teeth bifid; beak inclined. Autumn. Common in hilly regions. Fairfield, Franklin, Lake, Lawrence, Logan, Summit.

Dicranella heteromalla var. *stricta* Br. & Sch. Scales spreading at less than a 45 degree angle; seta longer and more flexuous than in the preceding species. Lake Co.

Dicranella heteromalla var. *orthocarpa* Hedw. Sporangium erect and actinomorphic, becoming furrowed and curved with age. Lake Co.

Dicranella fitzgeraldi Ren. & Card. (*D. heteromalla* var. *fitzgeraldi* Grout). Yellowish-green mosses with usually simple gametophores; scales crowded, erect-spreading, somewhat secund, lance-ovate at the base, subulate, grooved, denticulate near the apex; seta yellowish-red, dark brown when old; sporangium erect, actinomorphic, oblong, almost smooth when dry, not constricted below the mouth. On soil Not yet reported from Ohio but is found in western Pennsylvania near our border.

Dicranella cerviculata Schimp. (*Dicranum cerviculata* Hedw.; *Dicranella pusilla* (Hedw.) E. G. Britt.). Yellowish-green mosses with simple gametophores, not more than $\frac{1}{2}$ in. tall; scales erect-spreading, sometimes secund, base ovate, half-clasping, only slightly denticulate, costa excurrent; seta yellowish, flexuous, to $\frac{1}{2}$ in. long; sporangium short-oval, light brown, curved, strumose, irregularly ribbed when dry; lid long rostrate-subulate. Lesquereux reports this species as "very rare" upon the sides of ditches in the cranberry marshes of northern Ohio.

Dicranella varia (Hedw.) Schimp. (*D. rubra* (Huds.) Lindb.; *Dicranum varium* Hedw.; *Anisothecium rubrum* Lindb.). Densely gregarious to cespitose, bright green to yellowish-green, gametophores branching, erect or ascending, usually not more than $\frac{1}{2}$ in. tall; scales erect-spreading, usually somewhat secund, lanceolate, gradually subulate, grooved, margins recurved, only slightly denticulate, costa percurrent; seta reddish, glistening, ascending or erect, twisted to the right, to $\frac{1}{2}$ in. long; sporangium reddish-brown, oblong-ovate, slightly curved, smooth, constricted below the mouth; peristome teeth purplish, cleft to the middle; lid long-rostrate. Autumn or winter. Wet clay soil. This is a widely distributed species, but is not yet reported from Ohio.

Dicranella rufescens (Dick.) Schimp. (*Anisothecium rufescens* Lindb.). Cespitose, reddish to yellowish-green, redder when dry, less than $\frac{1}{2}$ in. tall, usually simple; scales pellucid, few, plane, linear-lanceolate, gradually narrowed, slightly denticulate toward the apex, costa percurrent; seta red, twisted toward the left, about $\frac{1}{4}$ in. long; sporangium dark red, ovoid-globose, erect, actinomorphic, mouth wide; operculum large, conic-rostrate, apex oblique; calyptra cucullate. Summer or fall. Bare moist soil. Not yet reported from Ohio.

7. RHABDOWEISIA Br. & Sch.

Small, densely cespitose mosses with 5-angled, branched stalks, radiculose below; scales dense, decurrent, crisped when dry, plane, costa ending below the apex; seta light yellow, erect; sporangium erect, 8-striate, actinomorphic, annulus none; operculum long-oblique rostrate; calyptra cucullate.

Rhabdoweisia fugax (Hedw.) Br. & Sch. (*Weisia fugax* Hedw.). Usually dark green, $\frac{1}{2}$ – $\frac{1}{2}$ in. tall; scales linear-lanceolate, acute to acuminate, somewhat concave, crisped when dry, faintly denticulate near the apex; seta $\frac{1}{8}$ in. or less in length; sporangium oval, wide-mouthed, brownish, peristome teeth abruptly subulate, papillose. Usually in crevices in sandstone. Spring. Lake, Lawrence.

8. ONCOPHORUS Brid. (*Cynodontium* Br. & Sch.).

Scales sheathing, ascending to squarrose, long-acuminate to subulate, margins recurved, crispate, never falcate-secund, costa distinct; seta erect; sporangium zygomorphic in our species, strumose, almost smooth when dry, annulus indistinct; peristome of 16 teeth, united at the base, divided to the middle; operculum obliquely rostrate; calyptra cucullate.

1. Scales gradually lanceolate from an ovate base..... *O. virens*
1. Scales abruptly subulate from an obovate base..... *O. wahlenbergii*

Oncophorus virens (Ws.) Brid. (*Dicranum virens* Hedw.; *Bryum virens* Sw.). Robust, cespitose, branching, 2–3 in. tall, bright green above, brown tomentose below; scales smooth, entire or slightly serrate, somewhat crispate, costa excurrent; antheridia sessile below the perichaetium; seta yellow, about 1 in. long; sporangium dark reddish-brown, arcuate. Wet rocks and stony ground. Late summer and autumn. Lake Co.

Oncophorus wahlenbergii Brid. (*Cynodontium virens* var. *wahlenbergii* Sahimp.). Cespitose, branching, 1-1½ in. tall, tomentose below; scales strongly crispate, point flexuose, costa excurrent; seta yellow or reddish, ½ in. long; sporangium short, ovoid, often horizontal, curved; peristome teeth divided below the middle. Not reported.

9. DICRANUM Hedw.

Large mosses, thickly tomentose below; scales unusually falcate-secund, lanceolate to lance-subulate, margins plane in the upper half, not thickened, ours with a narrow semiterete costa; sporangium often strumose, annulus present; teeth red, cleft to the middle; calyptra cucullate; our species unisexual.

- | | |
|--|----------------------|
| 1. Scales transversely undulate..... | 2 |
| 1. Scales not transversely undulate..... | 5 |
| 2. Upper cells of the scales longer than broad, porous..... | 3 |
| 2. Upper cells of the scales shorter or irregular, not porous..... | 4 |
| 3. Scales recurved with spinulose teeth at the margins and back of the costa; setae clustered..... | <i>D. polysetum</i> |
| 3. Scales with saw-like teeth, almost smooth at the back of the costa; seta solitary..... | <i>D. bonjeanii</i> |
| 4. Scales lanceolate, tapering, not papillose..... | <i>D. bergeri</i> |
| 4. Scales ovate, broadest at ½ the distance from the base, suddenly subulate, papillose above..... | <i>D. spurium</i> |
| 5. Upper cells longer than broad, porous..... | <i>D. scoparium</i> |
| 5. Upper cells not porous..... | 6 |
| 6. Scales distinctly serrulate above, papillose at the back..... | 7 |
| 6. Scales entire or serrulate near the apex only, smooth or nearly so..... | 8 |
| 7. Small; scales spreading, costa ending in the apex..... | <i>D. montanum</i> |
| 7. Larger; scales falcate secund, costa often excurrent..... | <i>D. fuscescens</i> |
| 8. Scales fragile, usually broken at the apex, entire..... | <i>D. viride</i> |
| 8. Scales not fragile, toothed at least at the apex..... | 9 |
| 9. Costa not excurrent, scales strongly crisped when dry, distinctly toothed near the apex..... | <i>D. flagellare</i> |
| 9. Costa excurrent, scales slightly or not at all crisped, finely serrate..... | <i>D. fulvum</i> |

Dicranum polysetum Swartz, Schw. (*D. undulatum* Ehrh.; *D. rugosum* Brid.). Loosely cespitose, branched, up to 5 in. tall, glossy; scales long-acuminate, wide at the base, sharply serrate in the outer half, inner half recurved, strongly secund; a gray tomentum over the stalks; setae copper-colored; sporangium cernuous, arcuate, lid with a long subulate rostrum. On soil. Fall. No reports.

Dicranum bonjeanii DeNot. (*D. palustre* LaPyl.). Loosely cespitose, branched, 2-3 in. tall, glossy; scales dense, only slightly secund, long-tapering, lanceolate, finely serrate, slightly undulate, costa narrow; sporangium slightly cernuous, arcuate, slightly striate, yellow; lid long-subulate. Late summer. On wet soil. Ashtabula, Fairfield, Lake.

Dicranum bergeri Bland. (*D. schraderi* Web. & Mohr.). Densely cespitose, yellowish-green; scales appressed, sub-secund, lanceolate, obtuse at the apex, undulate, sharply dentate on the outer half and back, costa not reaching the apex; sporangium obscurely striate; seta pale. In bogs. There is no specimen in the herbarium although it is listed as common in Beardsley's catalog.

Dicranum spurius Hedw. Densely cespitose, branched, 1-1½ in. tall, scales dense, distinctly undulate, slightly secund, serrate at the edge and on the back, lanceolate, broad-ovate at the base, costa subpercurrent, perichaetial scales tubulose; seta solitary, 1 in. long, slender, yellowish-red; sporangium arcuate, cernuous, strumose, striate when dry, red at the mouth. Spring. On rocks and sand. No definite reports.

Dicranum scoparium (L.) Hedw. (*Bryum scoparium* L.). Loosely cespitose, ½-2½ in. tall, yellowish to dark green; scales dense, long and slender, acuminate, concave, not undulate, serrate in the upper one-fourth, strongly secund, with 4 lamellæ on the back; seta single, reddish, glistening; sporangium reddish-brown, arcuate; operculum with a long curved point. On soil, logs and stones in the woods. Late summer and fall. Champaign, Clarke, Fairfield, Hamilton, Holmes, Hocking, Knox, Lake, Lawrence, Licking, Logan, Ross.

Dicranum flagellare Hedw. Densely cespitose, erect, 1-1½ in. tall, deep green, radiculose below; scales somewhat falcate-secund, gradually lanceolate, involute to near the apex, serrate at the apex, costa percurrent, the upper scales often with slender flagellate branches in their axils; sporangium erect, cylindrical, actinomorphic, striate, slightly curved when dry; tips of the teeth hyaline; lid long-rostrate. Summer. Decaying wood and bases of trees. Champaign, Clarke, Fairfield, Franklin, Lake, Licking, Montgomery.

Dicranum montanum Hedw. Densely cespitose, light green, erect, ¼-½ in. tall; scales secund or spreading, much crisped when dry, linear-lanceolate, concave, serrate near the apex, papillose on the back, basal cells brownish; seta single, erect, about ½ in. long; sporangium yellowish, plicate, oblong-cylindrical; teeth cleft nearly to the base; lid long-rostrate. Early fall. Rotten wood and tree trunks. Champaign, Lake.

Dicranum fuscescens Turn. Cespitose, yellowish-green, 1½-2 in. tall, tomentose; scales dense, narrowly lanceolate, concave, entire or slightly dentate, costa percurrent or excurrent, to ½ the width of the scale at the base, variable in margins and surface; seta single ½-¾ in. long, light yellowish-brown, sporangium erect, oblong-oval, striate when dry, hypophysis short and tapering, lid with a point as long as the sporangium. Autumn. On rocks, wood, or base of tree. Lake, Logan.

Dicranum viride (Sull.) Lindb. Densely cespitose, light to dark green, ¼-¾ in. tall; scales dense, spreading, narrowly lanceolate, concave, entire, minutely serrate at the tip, costa percurrent, crisped when dry; sporangium oblong, erect or slightly curved when dry. Summer. On wood. Champaign, Clarke.

Dicranum fulvum Hook. (*D. interruptum* Br. & Sch.). Silky, light green cespitose mosses, about ½ in. tall, brown radiculose below; scales dense, linear-lanceolate, not crisped when dry, finely serrate in the outer portion, secund, costa distinct, slightly excurrent; seta single, yellowish to darker, ½ in. long; sporangium erect, cylindrical, actinomorphic or slightly arcuate, brownish. Autumn. Non-calcareous rocks in moist woods. Clarke, Fairfield, Lake.

10. DICRANODONTIUM Br. & Sch.

Slender, cespitose, bright green mosses, densely radiculose below; scales somewhat distant, long, soft and silky; seta single, very slender; sporangium erect, cylindrical; hypophysis tapering; operculum with inclined beak almost as long as the sporangium; peristome inserted below the sporangium mouth, teeth cleft, striate; calyptra cucullate.

Dicranodontium longirostre (Starke) Br. & Sch. (*Didymon longirostre* Starke; *Didymon denudatus* Lindb.). Scales long-subulate, caniculate, costa excurrent, entire, faintly toothed near the apex; seta curved; peristome red. Fall and winter. Usually on rocks. Fairfield Co.

11. BROTHËRA C. Muell.

Densely cespitose, pale green, radiculose; scales erect-spreading, linear-lanceolate, subulate, almost entire, costa broad, filling the outer part of the leaf, abortive scales forming tufts in the axils of the upper scales; seta erect or slightly curved; sporangium smooth, erect; peristome teeth divided to near the base; calyptra large, cucullate, fringed at the base.

Brothera ledna (Sull.) C. Muell. (*Campylopus leanus* Sull.). Small mosses up to $\frac{1}{2}$ in. tall, rarely branched; seta less than $\frac{1}{2}$ in. long; sporangium oblong to elliptical, not stomate. No definite reports can be found of this species although R. S. Williams, Sullivant, and Lesquereux include Ohio in its range.

TORTULACEÆ.

Small to medium-sized, cespitose mosses; scales dense with a hyaline or colored base; sporangium erect or rarely inclined, actinomorphic or slightly curved; peristome usually of 16 deeply-divided teeth, sometimes wanting.

- | | |
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| 1. Scales widest in the lower half, usually acute..... | 2 |
| 1. Scales widest in the outer half, obtuse, costa excurrent..... | 9 |
| 2. Plants minute, cleistocarpous..... | 3 |
| 2. Plants larger, with a lid..... | 4 |
| 3. Margins strongly involute..... | <i>Astomum</i> |
| 3. Margins slightly revolute..... | <i>Phascum</i> |
| 4. Scales revolute, basal cells rarely hyaline, usually reddish or yellowish.... | 5 |
| 4. Scales plane or involute, basal cells mostly hyaline..... | 6 |
| 5. Peristome of 16 teeth, not twisted to the right, cleft..... | <i>Didymodon</i> |
| 5. Peristome of 32 teeth, strongly twisted to the left, filiform..... | <i>Barbula</i> |
| 6. Scale margins plane, peristome none..... | <i>Gymnostomum</i> |
| 6. Scale margins involute, at least above..... | 7 |
| 7. Peristome none, operculum deciduous, attached to the columnella, | <i>Hymenostylum</i> |
| 7. Peristome present..... | 8 |
| 8. Margins strongly involute..... | <i>Weisia</i> |
| 8. Margins plane, or involute only above..... | <i>Tortella</i> |
| 9. Peristome wanting..... | <i>Pottia</i> |
| 9. Peristome present, but may be very short..... | 10 |
| 10. Peristome teeth 16, somewhat cleft; costa not excurrent, except in | <i>D. plinthobius</i> |
| 10. Peristome teeth 32; costa strongly excurrent..... | <i>Tortula</i> |

1. *ASTOMUM* Hampe.

Small, dull-green mosses; scales dense, lanceolate, entire, costa percurrent, or excurrent; sporangium usually immersed; calyptra cucullate.

1. Scales distinctly crisped when dry; sporangium globose, or subglobose. 2
1. Scales scarcely crisped when dry; sporangium ovoid. *A. nitidulum*
2. Branched, $\frac{1}{4}$ - $\frac{1}{2}$ in. tall; sporangium globose, brown. *A. crispum*
2. Usually simple, smaller; sporangium sub-globose, orange. *A. sullivantii*

Astomum crispum (Hedw.) Hampe. (*Weisia crispa* Mitt.; *Phascum crispum* Hedw.; *Systegium crispum* Schimp). Densely gregarious; lower scales smaller than the upper ones, linear-lanceolate, costa excurrent, papillose; seta shorter than the sporangium. Spring. Old fields. Not reported.

Astomum sullivantii Schimp. (*Systegium sullivantii* Jaeg.). Densely caespitose, dark green, erect. Autumn to early spring. Old fields. "Ohio" by Lesquereux.

Astomum nitidulum Schimp. (*Systegium nitidulum* Jaeg.; *Phascum nitidulum* Muell.). A small rare species, differing from *A. sullivantii* mainly in smaller and having shorter scales, rarely crisped when dry; seta about $\frac{2}{3}$ as long as the sporangium; lid obliquely rostrate. Reported from Ohio in H. C. Beardsley's catalog.

Astomum nitidulum var. *pygmaeum* Lesq. Minute, much branched; costa percurrent; sporangium orange, lid straight rostrate. Reported from "Central Ohio" in Mosses of Ohio, Lesquereux and James.

(These last two may both be variations of *A. sullivantii*, according to both Jennings and Grout).

2. *PHASCUM* (L.) Schreb.

Small mosses; ours with entire scales, papillose, ovate to lanceolate, costa excurrent in the uppermost; sporangium immersed or slightly excurrent.

Phascum cuspidatum (Schreb.) Hedw. (*P. acaulon* L.). Simple or sparingly branched, $\frac{1}{8}$ - $\frac{1}{16}$ in. tall; upper scales crowded, lanceolate, acuminate, carinate-concave, margins revolute, costa excurrent; lower ones more distant, spreading, hyaline, papillose dorsally; sporangium globose, immersed, reddish-brown; seta erect or curved. Spring. On waste ground and fields. No definite reports, although Beardsley reports it as common.

3. *POTTIA* Ehrh.

Small simple mosses; scales broad; tufted above, carinate or deeply concave, papillose; seta erect, sporangium oval or cylindrical.

Pottia truncata (Hedw.) Fuern. (*P. truncatula* Lindb.; *Gymnostomum truncatum* Hedw.). About $\frac{1}{4}$ in. tall, radiculose at the base; margins plane, crisped when dry, acute, costa distinct; seta $\frac{1}{4}$ - $\frac{1}{2}$ in. long, yellowish; sporangium erect, actinomorphic, brownish; lid somewhat flattened. Autumn to spring. On wet soil. Reported from Ohio in Morgan's Flora.

4. WEISIA Hedw.

Small mosses with erect gametophores; scales erect-spreading, crisped when dry, elongate-lanceolate, upper larger than the lower, costa distinct, excurrent in a short point, upper surface papillose; seta long, usually erect; peristome small, teeth undivided, papillose.

Weisia viridula (L.) Hedw. (*Bryum viridulum* L.; *Mollia viridula* Hedw.). Dense, yellowish-green, about $\frac{1}{8}$ in. tall; upper scales tapering gradually to an acute or acuminate point; seta $\frac{1}{4}$ – $\frac{1}{2}$ in. long, slender, yellowish; sporangium erect, ovoid, reddish-brown, grooved when dry; lid conic, obliquely-rostrate; spores orange, papillose. Spring. On bare soil. Clarke, Lawrence, Montgomery.

Weisia viridula var. *gymnostomoides* (Brid.) Braith. (*Hymenostomum microstomum* Aust.). Scales shorter and broader than in the preceding, peristome teeth short and truncate, lid with a shorter point. Reported from Ohio by H. C. Beardsley.

5. GYMNOSTOMUM Hedw.

Unisexual, reddish-brown below, sparingly radiculose; scales tufted and larger at the top, erect-spreading, not crisped when dry, margins plane, costa ending below the apex, seta erect, long; sporangium actinomorphic, operculum early deciduous, calyptra cucullate.

1. Scales obtuse, ligulate..... *G. calcareum*
1. Scales acute or subacute..... *G. rupestre*

Gymnostomum calcareum Nees. & Hornsch. (*Mollia calcarea* Lindb.). Dense, erect, branched, about $\frac{1}{8}$ in. tall, yellowish-green; scales spreading, recurved, concave, obtuse; sporangium oblong, yellowish-brown, hypophysis tapering; rostrum oblique. On limestone rocks. Summer. Lake Co.

Gymnostomum rupestre Schwang. (*Mollia aeruginosa* (Sw.) Lindb.). Larger than the preceding and not so densely cespitose; scales linear-lanceolate; sporangium ovate-oblong to sub-globose, yellowish or reddish-brown, seta reddish. Summer. On limestone. Lake Co.

6. HYMENOSTYLIUM Brid.

Densely cespitose, sparingly radiculose; scales dense, erect-spreading, not crisped when dry, but sometimes twisted, lanceolate, acuminate; seta erect, long; sporangium actinomorphic, operculum remaining attached to the columnella; lid oblique-rostrate; calyptra cucullate.

Hymenostylium curviröstre (Ehrh.) Lindb. (*Gymnostomum curviröstre* Hedw.; *Weisia curvirostris* Muell.). Light, bright green, fragile, 1 in. or more tall; scale bases sub-clasping, margins entire, recurved, cells papillose; seta $\frac{1}{4}$ – $\frac{1}{2}$ in. long, castaneous; sporangium ovate, castaneous; spores yellowish. Late summer. Wet and usually calcareous rocks. Clarke, Lake.

7. DIDYMODON Hedw.

Mostly slender mosses; scales dense, lanceolate, scarcely crisped when dry, margins revolute, costa strong; sporangium erect, smooth, peristome of 16 teeth; operculum conic-rostrate; calyptra cucullate.

1. Lower portion of the plant reddish; scales acute or long sub-obtuse,

D. recurvirostre

1. Lower portion of the plant brown; upper scales short and obtuse.. *D. tophaceus*

Didymodon recurvirostre (Dicks.) Jenn. (*D. rubellus* Br. & Sch.; *Barbula rubella* Mitt.; *Weisia recurvirostre* Hedw.). Densely cespitose, branched, about $\frac{1}{2}$ in. tall, red below; scales spreading, costa sometimes excurrent in a short point, upper scales papillose, basal ones almost transparent; seta red, about $\frac{1}{2}$ in. long; sporangium cylindrical-oblong; peristome reddish, teeth filiform. Late summer and autumn. Moist stones. Champaign, Clarke.

Didymodon tophaceus (Brid.) Jur. (*Trichostomum tophaceum* Brid.; *Barbula longifolia* (Dicks.) Lindb.; *Barbula tophaceæ* Mitt.). Branching, about $\frac{1}{2}$ in. tall, brown below; scales spreading, a tuft of short, blunt scales at the tip, costa never excurrent; seta erect, slender; sporangium oblong-ovate. Limestone soil.

8. TORTÉLLA (C. Muell.) Limp.

Densely cespitose, yellowish-green, brownish radiculose below; scales spreading to recurved, crisped when dry, elongate to linear-lanceolate, margins involute to plane, entire, undulate, costa ending at the apex or excurrent; seta red, erect; peristome of 32 teeth, sinistrorsely wound, papillose; calyptra cucullate.

1. Scales abruptly mucronate with excurrent costa, hermaphroditic.. *T. humilis*
1. Scales long-acuminate; unisexual..... 2
2. Scales straight, rather rigid, mostly broken..... *T. fragilis*
2. Scales twisted, crisped when dry, less fragile..... *T. tortuosa*

Tortella humilis (Hedw.) Jenn. (*T. caespitosa* (Schwaeg.) Limp.; *Tortula caespitosa* Hook. & Grev.; *Tortula humilis* Brid.; *Bryum humilis* Hedw.). Loosely cespitose, branched, $\frac{1}{8}$ – $\frac{1}{4}$ in. tall; scales oblong to linear-lanceolate, margins plane or slightly undulate, erect-spreading, costa excurrent, cuspidate, a triangular patch of hyaline cells at the base; seta copper-colored, erect, $\frac{1}{2}$ – $\frac{3}{4}$ in. long; hypophysis tapering; lid long-rostrate; calyptra cucullate; peristome single of 32 teeth, filiform. Summer. On soil and bases of trees. Champaign, Franklin, Lake.

Tortella tortuosa (L.) Limp. (*Barbula tortosa* Web.f. & Mohr.; *Tortula tortosa* Ehrh.). Branched, green above; scales crowded near the apex, linear-lanceolate, spreading, tapering, long-acuminate, costa excurrent; seta reddish to paler above; sporangium cylindric, lid long-rostrate, oblique. On rocks. Not reported.

Tortella fragilis (Drumm.) Limp. Similar to the preceding, but smaller and more slender; scales long-acuminate, slender, and the tips of all except the youngest usually broken off. Summer. Not reported.

9. *BÁRBULA* Hedw.

Yellowish-green to brownish, forked; scales erect-spreading, linear-lanceolate, margins mostly revolute, costate, basal cells colored; seta erect; peristome sometimes rudimentary or none, teeth 32, filiform, dextrorsely twisted; operculum conic-rostrate; calyptra cucullate.

1. Scales gradually tapering to an acuminate point, brownish-green. *B. acuminata*
1. Scales obtuse, not tapering gradually; often mucronate, yellowish-green. . . . 2
2. Perichaetial scales sheathing, convolute. . . . *B. convoluta*
2. Perichaetial scales not differing perceptibly from the others. . . . *B. unguiculata*

Barbula acuminata Hedw. (*B. fallax* Hedw.). Loosely cespitose, brownish often reddish, fastigially branched, $\frac{1}{2}$ -2 in. tall; scales rather distant, spreading to recurved, margins revolute to beyond the middle, entire, costa strong, ending below the apex, perichaetial scales sheathing at the base; seta erect, slender, red; sporangium oblong-cylindric; operculum long-rostrate. Late fall to spring. Soil and rocks in limestone regions. Lake, Montgomery.

Barbula convoluta (Huds.) Hedw. Densely cespitose, branching, $\frac{1}{8}$ -1 in. tall; scales erect-spreading, crisped when dry, oblong to linear-lanceolate, concave, margins crenulate, costa strong, usually ending below the apex, sometimes minutely excurrent; seta light yellow to reddish; sporangium erect, reddish-brown, narrow oblong-cylindric. Spring. On soil in limestone regions. Reported from Ohio by Lesquereux.

Barbula unguiculata (Huds.) Hedw. Densely cespitose, branching, $\frac{1}{8}$ -1 in. tall; scales erect-spreading or somewhat recurved, spirally twisted when dry, oblong-lanceolate, mucronate, costa strong, basal cells yellowish-pellucid to hyaline; seta erect, $\frac{1}{2}$ -1 in. long, red, slender; sporangium erect, oblong-cylindric. Late fall to spring. On soil and rocks. Fairfield, Lake, Montgomery.

10. *DESMÁTODON* Brid.

Small, slender, branched mosses; scales papillose; seta erect, elongated; sporangium erect, cylindrical; peristome irregularly cleft, short basal membrane very inconspicuous; lid long-rostrate, thick, oblique; calyptra cucullate.

1. Scale margins plane, bordered by light cells. . . . *D. porteri*
1. Scale margins recurved. . . . 2
2. Costa excurrent in a long, smooth arista. . . . *D. arenaceus*
2. Costa not excurrent, scales mucronate. . . . *D. plinthobius*

Desmatodon oblongifolius Schwaeg. (*D. arenaceus* Sull.; *D. ohioensis* Schimp.; *Didymodon arenaceus* Lindb.). Gregareous, yellowish-green, radiculose at the base; scales tufted at the top, erect-spreading, crisped when dry, blunt, costa strong, margin crenulate, upper cells papillose; seta castaneous; sporangium dark-castaneous; peristome yellowish to reddish, teeth split to near the middle only. Spring. Sandy soil and rocks. Fairfield.

Desmatodon plinthobius Sull. & Lesq. (*Tortula plinthobius* (Sull. Broth.; *Barbula subcarnifolia* C. Muell. & Lindb.)). Scales obtuse, costa strong, arista as long as the remainder of the scale; sporophyte similar to the preceding genus; sporangium oblong to nearly cylindrical, peristome minute, pale. Rocks. Fairfield.

Desmatodon porteri James (*Tortula porteri* (Jas. & Aust.) Broth.). Minute mosses; scales brownish-green, tapering, bluntly acute; sporangium oblong, erect, teeth divided nearly to the base; seta orange. Spring. On rocks. Clarke.

11. TÓRTULA Hedw.

Robust plants, green to brown; scales oblong, larger near the tip of the gametophores, costa strong; sporangium cylindrical, peristome of 32 teeth, twisted towards the left, papillose; operculum conic, oblique-rostrate; calyptra cucullate, covering half of the sporangium.

- 1. Cells of the scales smooth, awn smooth.....*T. mucronifolia*
- 1. Cells of the scales papillose, awn rough, hyaline at the tip, colored below.....*T. ruralis*

Tortula ruralis (L.) Ehrh. (*Bryum rurale* L.; *Barbula ruralis* Hedw.). Loosely cespitose, light green above, brown below, 1-2 in. tall; scales dense at the apex of the stalk, more distant below, recurved-squarrose when moist, appressed when dry, entire, reflexed, costa excurrent into the rough awn; peristome teeth long, membrane ½ the height of the peristome; seta reddish at the base, lighter above. Spring. On rocks and sterile soil. Erie Co.

Tortula mucronifolia Schwaeg. (*Barbula mucronifolia* Br. & Sch.). Loosely cespitose; scales ovate to oblong, reflexed, costa excurrent into a smooth point; sporangium ovoid-cylindrical; basal membrane almost as long as the teeth; operculum conic, elongated. Summer. Reported by Lesquereux.

LEUCOBRYACEÆ.

Dense tufts of whitish to glaucous-green mosses, spongy when moist, brittle when dry; scales of three layers of cells, tubular above, costa covering most of the scale; operculum conic-rostrate; calyptra cucullate.

1. LEUCOBRYUM Hampe.

Unisexual; scales crowded; sporangium more or less arcuate, strumose, 8-striate; peristome of 16 teeth or of 8 teeth divided almost to the base, united at the base into a tube.

- 1. Scales large, tufts 2 in. or more deep; sporangium arcuate, strumose, *L. glaucum*
- 1. Scales small; tufts ½-¾ in. deep; sporangium nearly erect, and slightly or not at all strumose.....*L. albidum*

Leucobryum glaucum (L.) Schimp. (*L. vulgare* Hampe.; *Dicranum glaucum* Hedw.). Scales bristle-tipped, wide and clasping at the base, outer part rolled; seta erect, single, castaneous, sporangium decidedly arcuate and striate, distinctly strumose. Autumn. In moist woods on rocks and soil. Champaign, Fairfield, Fulton, Holmes, Lake, Portage, Seneca, Stark.

Leucobryum albidum (Brid.) Lindb. (*L. minus* Hampe; *Dicranum albidum* Brid.). A smaller species which Dixon describes as a sub-species of *L. glaucum*; scales more crowded, with the tubular portion of the scale scarcely as long or often much shorter than the ovate base. Late spring and early summer. On wood or soil. Champaign, Fairfield, Lawrence, Sandusky.

ENCALYPTACEÆ.

Cespitose branched mosses, bright green above, brown radiculose below; scales dense, bordered, twisted when dry, costa strong, dorsally papillose and toothed, basal cells hyaline or colored, smooth, upper cells papillose; seta erect, slender; sporangium cylindric, actinomorphic; calyptra completely enclosing the sporangium.

1. ENCALYPTA Schreb. Hedw.

Only one species of this family has been reported from Ohio.

Encalypta ciliata Hoffm. (*Leersia ciliata* Hedw.; *Leersia laciniata* Hedw.). Loosely cespitose, about 1 in. tall; scales apiculate, margins plane above, recurved below, costa excurrent or ending near the apex; calyptra fringed with narrow lanceolate teeth; peristome of 16 teeth; autoicous. Late summer or fall. Reported from Ohio by Lesquereux.

FISSIDENTACEÆ.

Minute to large mosses, gregarious or cespitose, light to dark green, reddish radiculose below; scales 2-ranked, vertically placed, the base sheathing, with an often decurrent dorsal lamina, usually costate, cells rounded-hexagonal; seta erect or curved; peristome, when present, red and simple, teeth usually cleft; calyptra conical, smooth.

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| 1. Dorsal laminae narrow; stalk bulbiform at the base; peristome wanting, | <i>Bryoxiphium</i> |
| 1. Dorsal laminae usually wider; stalk not bulbiform at the base; peristome present..... | 2 |
| 2. Terrestrial or submerged, not floating..... | <i>Fissidens</i> |
| 2. Aquatic, floating, filiform..... | <i>Octodicerias</i> |

1. BRYOXIPHUM Mitt. (Eustachia Brid.).

Gregarious, flat, usually simple mosses; scales imbricated, linear-lanceolate, glossy, bordered, costa percurrent, perichaetial scales long-acuminate; calyptra cucullate; unisexual.

Bryoxiphium norvegicum (Brid.) Mitt. "Sword Moss." Yellowish, $\frac{1}{8}$ –1 in. tall; scales short-acuminate; sporangium obovate, yellow, red at the mouth, inclined; seta thick; operculum red at the base, persistent; peristome none. Shaded vertical sandstone faces. Fairfield Co.

2. FISSIDENS Hedw.

Simple or sparingly branched mosses; scales strongly winged, linear-obovate to lance-obovate; antheridia in gemmiform buds; annulus narrow, teeth cleft; calyptra cucullate.

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| 1. Scales not bordered..... | 2 |
| 1. Scales bordered..... | 5 |
| 2. Costa excurrent in an apiculus..... | <i>F. taxifolius</i> |
| 2. Costa ending at or below the apex..... | 3 |
| 3. Scales entire, apex obtuse..... | <i>F. obtusifolius</i> |
| 3. Scales serrulate or crenulate..... | 4 |
| 4. Scales apiculate; seta terminal; costa to near the apex..... | <i>F. osmundoides</i> |
| 4. Scales more rounded; seta lateral; costa ending some distance below the apex..... | <i>F. subbasilaris</i> |
| 5. Costa none; very small mosses..... | <i>F. hyalinus</i> |
| 5. Costa distinct..... | 6 |
| 6. Border only on sheath..... | <i>F. exiguus</i> |
| 6. Border quite or nearly to the apex..... | 7 |
| 7. Border of narrow elongated cells; costa to the apex..... | 8 |
| 7. Border of paler cells of the same shape as the others; costa ending below the apex..... | 9 |
| 8. Border confluent with the costa, forming a blunt point..... | <i>F. bryoides</i> |
| 8. Border very narrow, almost disappearing below the apex..... | <i>F. incurvus</i> |
| 9. Plants less than $\frac{3}{4}$ in. tall; cells indistinct..... | <i>F. cristatus</i> |
| 9. Plants $\frac{3}{4}$ –4 in. tall; cells of the scales distinct..... | <i>F. adiantoides</i> |

Fissidens taxifolius (L.) Hedw. (*Hypnum taxifolius* L.). Light green, branching at the base, less than $\frac{1}{2}$ in. tall; scales crowded, oblong-ovate, obtuse, crenulate, costa strong; seta lateral, flexuous, reddish; sporangium usually curved, inclined or pendulous, oblong, brown; teeth cleft to below the middle. Late fall and winter. On moist soil in woods. Champaign, Clarke.

Fissidens hyalinus Wils. & Hook. Minute, pale simple mosses; scales in 3–5 pairs, oblong-lanceolate, acute, entire; seta terminal, erect; sporangium oblong, erect or oblique; operculum rostrate, calyptra covering the beak. Clay banks and rocky ledges. Rare. Hamilton, Lake.

Fissidens bryoides (L.) Hedw. (*Hypnum bryoides* L.). To $\frac{1}{4}$ in. tall; scales oblong, entire, costa strong; antheridia in axillary pediculate buds; seta terminal, erect, slender, copper-colored, less than $\frac{1}{2}$ in. long; sporangium erect, short, oblong-oval; teeth split $\frac{2}{3}$ their length. Late fall. Shaded pots in the greenhouse. Franklin, Lake.

Fissidens obtusifolius Wils. Minute, erect, simple mosses; scales entire, oblong, upper ones ascending, cells rounded, costa ending below the apex; seta erect, brownish; sporangium erect, oblong-ovate, brownish; operculum very short-rostrate; peristome yellowish-pellucid. Autumn. Wet rocks. Clarke, Fairfield, Hamilton.

Fissidens incurvus (Starke) Schw. Simple mosses, $\frac{1}{4}$ - $\frac{1}{2}$ in. tall; scales oblong-lanceolate, apiculate, or bordered to near the apex; seta reddish, $\frac{1}{4}$ - $\frac{3}{4}$ in. long; sporangium ovoid, cylindrical, curved; antheridia in basal buds. Late autumn. On rocks. Clarke Co.

Fissidens incurvus var. *minutulus* (Sull.) Aust. (*F. minutulus* Sull.). Minute, green erect, simple; scales in 3-7 pairs, narrowly oblong-lanceolate, margin entire or undulate, costa ending below the apex; seta reddish; sporangium usually actinomorphic and erect. Autumn. Damp rocks in the shade. Clarke, Franklin, Hamilton, Lake, Perry.

Fissidens exiguus Sull. (*F. incurvus* var. *exiguus* Aust.). Light green, very small; scales in 3-5 pairs, upper ones the largest, dorsal laminae narrowing to none at the base, costa ending below the apex; sporangium erect or inclined, oblong-oval, reddish-yellow. Early fall. Rocks in ravines and streams. Franklin Co.

Fissidens cristatus Wils. (*F. decipiens* DeNot). Slender mosses, branching at the base, $\frac{1}{2}$ -1 in. tall; scales numerous, imbricated, ovate-lanceolate, laminae somewhat decurrent; seta lateral, brown; sporangium oblong, tapering, constricted below the mouth, nearly erect, golden-brown; teeth cleft into very narrow divisions. Winter and early spring. Soil, stones, or bases of trees. Champaign, Franklin, Muskingum.

Fissidens adiantoides (L.) Hedw. (*Hypnum adiantoides* L.). Light green, slender, branching; scales serrate, oblong-lanceolate, border often indistinct, laminae ending abruptly at the base; seta lateral, reddish-brown, flexuous, $\frac{1}{2}$ -1 in. long; sporangium horizontal to erect; antheridia axillary. Winter. Clay soil, rocks, and bases of trees. Champaign, Clarke, Franklin, Lawrence.

Fissidens osmundoides (Swartz.) Hedw. (*Dicranum osmondoides* Swartz). Dark green, erect, branched, tomentose below; scales oblong-lanceolate obtuse, apiculate, serrulate near the tip, non-bordered, laminae not decurrent, costa to near the tip; seta terminal, reddish-brown, $\frac{1}{4}$ - $\frac{1}{2}$ in. long; sporangium darker, horizontal or inclined, mouth wide, hypophysis tapering; operculum with a long straight beak. Summer. On ground or tree trunks in swamps. Champaign Co.

Fissidens subbasilaris Hedw. Green, with a brown tomentum below, $\frac{1}{4}$ - $\frac{3}{4}$ in. tall; scales oblong, obtuse, apiculate, serrulate near the apex, costa ending some distance below the apex, laminae large, rounded at the base; seta lateral, yellowish-brown, reaching to the top of the gametophore; sporangium oblong-cylindrical, nearly erect, smooth, brown, hypophysis tapering; peristome darker, teeth cleft to the middle, points slender; operculum with an oblique point half the length of the sporangium. Late autumn. Trees and rocks. Champaign, Clarke.

3. OCTODICERAS Brid. (*Concomitrum* Mont.).

Slender, floating, branched mosses; scales distant, linear-lanceolate; seta short; sporangium small; calyptra mitrate, operculum conic-rostrate.

- 1. Much branched, 2-6 in. long.....*O. debilis*
- 1. Sparingly branched, less than 1/2 in. long.....*O. hallianus*

Octodiceras debilis (Schw.) Jenn. (*O. julianus* Brid.; *Concomitrum julianum* Mont.; *Fontinalis juliana* Savi.; *Fissidens julianus* Schimp). Flaccid, blackish-green below; scales long, spreading, non-bordered, inferior laminae not reaching the base, costa vanishing below the apex; seta fragile, shorter than the sporangium; teeth degenerate. In streams and swamps on wood and stones. Summer. Reported from Ohio by Lesquereux.

Octodiceras hallianus (Sull. & Lesq.) Jaeg. & Sauer. (*Concomitrum hallianum* Sull. & Lesq.; *Fissidens hallianus* Mitt.). Dark green, in loose, floating tufts; scales narrowly linear, entire; seta longer than the sporangium; sporangium obovate, pale; teeth not divided; calyptra cucullate. On partially submerged wood and stones in streams and swamps. Not yet reported.